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Title : The probabilities of extinction of Steller sea lion populations in Alaska

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Student : Not Applicable

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Abstract : Estimating the probability of a population going extinct is fundamental to determining the conservation status of that population and assessing its recovery. We performed a population viability analysis (PVA; a computer simulation technique) to quantify the extinction risk for individual rookeries of Steller sea lions (*Eumetopias jubatus*) in Alaska. Key features of our model included age-structure, density-dependent and -independent changes in birth and survival rates over time, and demographic and environmental stochasticity. Model parameters were estimated using Bayesian statistical methods (which take uncertainty into account) and historical counts of Steller sea lion pups and non-pups on rookeries. Fitting our model to the count data yielded estimates of population sizes, birth rates and survival rates that were consistent with previous studies. Probability distributions for model parameters provided a starting point for simulating future population trajectories. We examined three scenarios: continuation of current population trends, return to historical carrying capacity, and regulation at a new reduced carrying capacity. Our PVA suggested that there are relatively high probabilities of extinction for populations at many rookeries within the next 100 years if current trends continue. However, if populations begin to recover in the near future, and continue to grow in size, there is a high probability that they will return to historical numbers in the next 100 years. If carrying capacities are indeed lower than they were in the past (e.g., due to oceanographic changes), our model predicts that the new carrying capacities are quite small and these smaller populations may be at a greater risk of extinction from random factors. The three scenarios resulted in very different estimates of risk of extinction and show how dependent such probabilities are on assumptions about the roles that density-dependent and -independent factors play in population dynamics. Overall, our analysis provides quantitative estimates of the risk that Steller sea lion populations may go extinct in Alaska, which are necessary in the use of decision analysis techniques that assess tradeoffs amongst different management actions.